

REMARKS/ARGUMENTS

Reconsideration of the above application in view of the above amendment and the below remarks is requested. Claims 1 and 2 have been amended to further define the invention.

In the Office Action, the Patent Office rejected claims 1 and 2 under 35 U.S.C. § 103(a) as allegedly being unpatentable over Takano et al (JP 2002-006514). Applicants note that JP 2002-006514 corresponds to United States Patent No. 7195863, which is a related case to the above application.

The Patent Office states that Takano et al teach that adjusting the mixing ratio of acid to base affects the reduction of thickness of the resist. The Patent Office admits that Takano et al do not teach the surfactant being one that is formed at the equivalent ratio of acid to base as found in applicants' claims.

In Takano et al in [0019], (perhaps better taken from United States Patent No. 7195863 at column 5, lines 23 to 33; emphasis added), the ratio of acid and base is discussed as follows:

That is, in the case of using, for example, a positive-working photoresist as the chemically amplified photoresist, it suffices to adjust, upon using a salt between the organic acid and the amine or ammonium as the surfactant, the mixing ratio of the organic acid to the amine or ammonium so that pH of the composition for reducing development defects becomes at an optimal pH within the above-described range ["PH of the composition is preferably 1.5 to 4.5, more preferably 1.7 to 3.5."; column 4, lines 57 and 58]. It has been found that, in this mixing, better

results can often be obtained when the organic acid is used in an amount more than the equivalent amount of the base,

Furthermore, Takano et al at [0017] state that "when a chemistry magnification mold photoresist is a positive type, that whose constituent for development defective reduction is acidity is used preferably. As for the acid condition of this constituent, it is desirable that it is pH 1.5-4.5, and it is still more desirable that it is 1.7-3.5."

The present application states that

the amount of film thickness reduction subsequent to a development of a positive-working chemically amplified photoresist can be enlarged when the equivalent of acid and base which constitute the surfactant is made excess of base compared with acid upon a formation of a surfactant which is contained in the composition for preventing development defects, and the amount of film thickness reduction of a photoresist subsequent to a development can be increased or decreased by controlling the amount of the base used at this time, (page 9, middle paragraph, emphasis added)

In order to make the amount of reduction in thickness of photoresist film after developing treatment big in amount, when forming the surfactant described in above items (1) to (4) which is contained in the composition for preventing development-defects, an equivalent quantity of base is made excessive to that of acid in the present invention. (page 12, top of page, emphasis added)

Thus, Takano et al require that there be an excess of acid as opposed to applicants' invention which is for an excess of base.

The Patent Office states that Takano et al show that the film loss in quantity at the time of development is the result effective variable [0019] and that it is then optimizable. However, contrary to the view by the Patent Office, the skilled artisan would not optimize the ratio of acid to base as taught by Takano et al to match that of applicants' invention

since Takano et al teach in [0019] that the with a positive photoresist, the ratio of an organic acid:base, in mole ratio, is usually from 7:0 to about 7:6, it is desirable 7:4 - 7:6 and more preferably 7:5.¹ The aforementioned ratios in Takano et al show an excess of acid to base, the opposite of applicants' invention. Takano et al also do not teach or suggest that amount of film thickness reduction of a photoresist subsequent to a development can be increased or decreased by controlling the amount of the base used.

The Patent Office has the burden of showing that having an acid:base ratio where the amount of acid is greater than base (which is Takano et al) can be optimized by a skilled artisan to one where the acid:base ratio is where the amount of base is greater than acid (applicants' invention) and that the skilled artisan would know to do this based on the teaching of Takano et al.

Takano et al do not teach a skilled artisan to go beyond the acid:base ratios listed therein. Takano et al state that "... when a chemistry magnification mold photoresist is a positive type, that whose constituent for development defective reduction is acidity is used preferably. As for the acid condition of this constituent, it is desirable that it is pH 1.5-4.5, and it is still more desirable that it is 1.7-3.5." (see [0017] of Takano et al (emphasis added))².

¹ see also United States Patent No. 7195863 at column 5, lines 41 to 46 (emphasis added) - " In the composition for reducing development defects to be applied to a positive-working chemically amplified photoresist, the ratio of the organic acid to the base (for example, amine) is usually about 7:0 7:6 in molar ratio, preferably about 7:4 7:6, more preferably about 7:5. "

² see also United States Patent No. 7195863 at column 4, lines 55-58 (emphasis added) " ... when the chemically amplified photoresist is positive-working, the composition for reducing development defects is preferably acidic. PH of the composition is preferably 1.5 to 4.5, more preferably 1.7 to 3.5."

Takano et al also state that there are other ways to optimize reduction in film thickness. See Takano et al at generally at [0022] to [0024] (see United States Patent No. 7195863 at column 6, lines 26 to 51 (emphasis added):

Additionally, in order to improve coating properties, a water-soluble organic solvent may be used together with water. ...

In addition, optimization of reduction in thickness of resist coating in the present invention may also be attained by properly adjusting baking time or baking temperature of the resist and the composition for reducing development defects as well as optimization by the composition itself for reducing development defects.

The Patent Office has not shown that the ratio of acid:base in Takano et al is a result effective variable since the ratio of acid:base in the present application (amount of base is greater than amount of acid) is outside the acid:base ratio disclosed by Takano et al (amount of acid is greater than amount of base) and that there are other factors that are result effective variables. There is no demonstration in Takano et al that varying the acid:base ratio has an effect on defects, especially when acid:base ratio of Takano et al is exceeded.

Thus, the ratio of acid:base in Takano et al is not the only way to optimize the reduction in film thickness and that it is not the only result effective variable. The Patent Office has not met its burden of establishing that Takano et al recognized acid:base ratio as the only variable that is result effective, especially since applicants have distinguished their acid:base ratio over that which is disclosed by Takano et al. As stated by applicants in their specification:

In addition, in the publication [Japanese Unexamined Patent Publication No. 2002-6514], there is no description that a film thickness reduction can be controlled quantitatively. Because of this there is a problem that it is difficult to obtain the composition for reducing development-defects which can provide an optimal film thickness reduction in order to make the pattern-profiler rectangular and good. (top of page 8, emphasis added).

The Patent Office has skipped over its burden to establish an evidentiary foundation for the *prima facie* case of obviousness. In particular, the Patent Office has not supported its assertion that changing the acid:base ratio as claimed by applicants is a known result-effective variable that would have been obvious to optimize. Establishing such a foundation is particularly important when since applicants have distinguished their acid:base ratio from that of Takano et al as shown above.

In addition, applicants' Examples show that compositions having an acid:base ratio where the amount of base is greater than the amount of acid have better performance than compositions where the acid:base ratio has an amount of acid greater than the amount of base (see pages 20 to 22 of applicants' specification). The burden is on the Patent Office to establish an adequate basis to question the adequacy of applicants' disclosure. Assertions in a disclosure must be met with evidence, not by mere counter-assertion or argument.

Given the teaching of Takano et al, there is no basis for a skilled artisan to go beyond the pH limits of Takano et al (1.5 to 4.5 - thus, an acidic medium) since Takano et al teach that the better results are obtained when the amount of organic acid is greater than the amount of the base. A skilled artisan would realize that based on the teaching of Takano et al, going to a system where the amount of base exceeds the amount of acid would not provide good results. The Patent Office has not shown that Takano et al teach or suggest a system that when the amount of base is greater than the amount of acid

(applicants' invention), better results are obtained where a system discloses that the amount of acid exceeds the amount of base (Takano et al). In taking such a view, the Patent Office is engaging in an invitation to experiment. Takano et al do not contain a sufficient teaching of how to obtain the desired result embodied by applicants' claims, or that the claimed result embodied by applicants' claims would be obtained if certain directions were pursued.

All the Patent Office has done is stated that the mixing ratio is the result effective variable and would then be optimizable. In reality, the Patent Office is suggesting the possibility that a skilled artisan might want to change the acid:base ratio taught by Takano et al to that which is claimed by applicants. However, that Takano et al could be modified to change the acid:base ratio from an amount of acid greater than the amount of base to an acid:base ratio where the amount of base is greater than the amount of acid, which is applicants' invention, cannot be made unless Takano et al suggest such a desired modification. No such desired modifications are not taught or suggested by Takano et al.

The Patent Office has pointed to no passage in Takano et al which suggests or teaches increasing the amount of base so that it exceeds the amount of acid as applicants have claimed. Since there is no cited passage by the Patent Office, it can only be presumed that the Patent Office's obviousness conclusion is based on impermissible hindsight.

Manifestly, applicants' claimed acid:base ratio is far outside the corresponding acid:base ratio of Takano et al. It is well settled that the discovery of optimum values, which are far outside the prior art values and not in anyway suggested by the prior art as here, likely would not have been obvious. Stated another way, it is generally not a matter of obviousness for one of ordinary skill in the art to optimize a result effective

variable outside the range disclosed in the prior art. When determining whether the claimed invention is obvious, a prior art document must be read as a whole and consideration must be given where the document teaches away from the claimed invention, which is the present case.

Coming to the conclusion that Takano et al teach or suggest applicants' acid:base ratio requires bridging several gaps in the path to the conclusion. Bridging those gaps requires knowledge of applicants' solution. The Patent Office states that Takano teaches that adjusting the mixing ratio of the acid to base affects the reduction of thickness of the resist (Office Action, page 3). While the statement linking acid:base ratio to reduction of thickness might lead one of ordinary skill in the art down the path of investigation, it does not directly teach how to obtain the desired reduction of film thickness achieved by applicants' acid:base ratio or indicate that the desired reduction of film thickness would be obtained if the acid:base ratio went from higher acid/low base to higher base/lower acid. The general disclosure must do more than lead one of ordinary skill in the art down the path of investigation, it must contain a sufficient teaching of how to obtain the desired result or must indicate that the claimed result would be obtained if certain directions were pursued. No such teaching exists in Takano et al.

Applicants' acid:base ratio is a difference in kind, not a difference in degree. Here, applicants' new acid:base ratio (where the amount of base is greater than the amount of acid) produces highly beneficial results:

" ... the amount of film thickness reduction subsequent to a development of a positive-working chemically amplified photoresist can be enlarged when the equivalent of acid and base which constitute the surfactant is made excess of base compared with acid upon a formation of a surfactant which is contained in

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the composition for preventing development defects, and the amount of film thickness reduction of a photoresist subsequent to a development can be increased or decreased by controlling the amount of the base used at this time ..." (see page 9 of applicants' application).

Such results are not predicted by Takano et al.

The rejection over Takano et al is traversed and withdrawal thereof is requested.

Applicants submit that the concerns of the Patent Office have been addressed. Withdrawal of the rejections and issuance of a Notice of Allowance is respectfully solicited.

Respectfully submitted,

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